

**WHAT IS CLAIMED IS:**

1. A method for communicating on a half-duplex channel, the method comprising:

transmitting a first frame;

terminating transmission of the first frame when a collision is detected during the transmission; and

transmitting a second frame before retransmitting the first frame when the second frame has a higher class of service than the first frame.

2. The method of claim 1, further comprising:

sending a jam signal before transmitting the second frame.

3. The method of claim 1, further comprising:

after terminating the transmission, incrementing an attempt count; and

discarding the first frame when the attempt count exceeds a predetermined attempt threshold.

4. The method of claim 1, wherein each class of service has a predetermined attempt threshold, further comprising:

after terminating the transmission, incrementing an attempt count; and

discarding the first frame when the attempt count exceeds the predetermined attempt threshold for the class of service of the first frame.

5. The method of claim 1, further comprising:

after terminating the transmission, incrementing the attempt count; and

discarding the first frame when the attempt count exceeds a predetermined attempt threshold and the class of service of the first frame falls below a predetermined discard threshold.

6. The method of claim 1, further comprising:

computing a back-off period after terminating the transmission when no frame ready for transmission has a higher class of service than the first frame; and retransmitting the first frame when the back-off period has elapsed.

5           7.       The method of claim 6, wherein computing the back-off period comprises: computing the back-off period as a function of the class of service of the first frame.

8.       The method of claim 1, wherein each class of service has an attempt count, further comprising:

10           after terminating the transmission, incrementing the attempt count for the class of service of the first frame and for any other class of service that is not greater than the class of service of the first frame and for which a frame is pending transmission; and

discarding all pending frames having an attempt count that exceeds a predetermined attempt threshold.

15           9.       The method of claim 8, further comprising:

before transmitting the second frame, transmitting a pending frame having a highest class of service that is less than the class of service of the first frame if the first frame was discarded.

20           10.      The method of claim 1, wherein each class of service has an attempt count and a predetermined attempt threshold, further comprising:

25           after terminating the transmission, incrementing the attempt count for the class of service of the first frame and for any other class of service that is not greater than the class of service of the first frame and for which a frame is pending transmission; and

discarding each pending frame when the attempt count for that frame exceeds the predetermined attempt threshold for the class of service for that frame.

30           11.      The method of claim 1, wherein each class of service has an attempt count, further comprising:

after terminating the transmission, incrementing the attempt count for the class of service of the first frame and for any other class of service that is not greater than the class of service of the first frame and for which a frame is pending transmission; and

discarding a given pending frame having an attempt count that exceeds a  
 5 predetermined attempt threshold when the class of service of the given pending frame falls below a predetermined discard threshold.

12. The method of claim 1, further comprising:

computing a back-off period after terminating the transmission when no frame ready  
 10 for transmission has a higher class of service than the first frame; and  
 retransmitting the first frame when the back-off period has elapsed.

13. The method of claim 12, wherein computing the back-off period comprises:  
 computing the back-off period as a function of the class of service of the first frame.

14. Computer-readable media embodying instructions executable by a computer  
 to perform a method for communicating on a half-duplex channel, the method comprising:

transmitting a first frame;

terminating transmission of the first frame when a collision is detected during the  
 20 transmission; and

transmitting a second frame before retransmitting the first frame when the second  
 frame has a higher class of service than the first frame.

15. The media of claim 14, wherein the method further comprises:

25 sending a jam signal before transmitting the second frame.

16. The media of claim 14, wherein the method further comprises:

after terminating the transmission, incrementing an attempt count; and

discarding the first frame when the attempt count exceeds a predetermined attempt  
 30 threshold.

17. The media of claim 14, wherein each class of service has a predetermined attempt threshold, and wherein the method further comprises:

after terminating the transmission, incrementing an attempt count; and

discarding the first frame when the attempt count exceeds the predetermined attempt

5 threshold for the class of service of the first frame.

18. The media of claim 14, wherein the method further comprises:

after terminating the transmission, incrementing the attempt count; and

discarding the first frame when the attempt count exceeds a predetermined attempt

10 threshold and the class of service of the first frame falls below a predetermined discard threshold.

19. The media of claim 14, wherein the method further comprises:

computing a back-off period after terminating the transmission when no frame ready

15 for transmission has a higher class of service than the first frame; and

retransmitting the first frame when the back-off period has elapsed.

20. The media of claim 19, wherein computing the back-off period comprises:

computing the back-off period as a function of the class of service of the first frame.

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21. The media of claim 14, wherein each class of service has an attempt count, and wherein the method further comprises:

after terminating the transmission, incrementing the attempt count for the class of service of the first frame and for any other class of service that is not greater than the class of service of the first frame and for which a frame is pending transmission; and

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discarding all pending frames having an attempt count that exceeds a predetermined attempt threshold.

22. The media of claim 21, wherein the method further comprises:

before transmitting the second frame, transmitting a pending frame having a highest class of service that is less than the class of service of the first frame if the first frame was discarded.

23. The media of claim 14, wherein each class of service has an attempt count and a predetermined attempt threshold, and wherein the method further comprises:

after terminating the transmission, incrementing the attempt count for the class of service of the first frame and for any other class of service that is not greater than the class of service of the first frame and for which a frame is pending transmission; and

discarding each pending frame when the attempt count for that frame exceeds the predetermined attempt threshold for the class of service for that frame.

24. The media of claim 14, wherein each class of service has an attempt count, and wherein the method further comprises:

after terminating the transmission, incrementing the attempt count for the class of service of the first frame and for any other class of service that is not greater than the class of service of the first frame and for which a frame is pending transmission; and

discarding a given pending frame having an attempt count that exceeds a predetermined attempt threshold when the class of service of the given pending frame falls below a predetermined discard threshold.

25. The media of claim 14, wherein the method further comprises:  
computing a back-off period after terminating the transmission when no frame ready for transmission has a higher class of service than the first frame; and  
retransmitting the first frame when the back-off period has elapsed.

26. The media of claim 25, wherein computing the back-off period comprises:  
computing the back-off period as a function of the class of service of the first frame.

27. An apparatus for use in a half-duplex channel, the apparatus comprising:  
transmitting means for transmitting data over the half duplex channel;

control means for terminating the transmitting means from transmitting a first frame of the data when a collision is detected during the transmission; and

wherein the transmitting means transmits a second frame of the data before retransmitting the first frame when the second frame has a higher class of service than the first frame.

28. The apparatus of claim 27, wherein the transmitting means, in response to the control means, sends a jam signal before transmitting the second frame.

29. The apparatus of claim 27, further comprising:  
attempt counter means for counting transmission attempts by the transmitting means,  
wherein the control means, after terminating the transmission of the transmitting means, increments the attempt counter means; and  
wherein the control means discards the first frame when the attempt count of transmission attempts by the attempt counter means exceeds a predetermined attempt threshold.

30. The apparatus of claim 27, wherein each class of service has a predetermined attempt threshold, further comprising:  
attempt counter means for counting transmission attempts by the transmitting means;  
wherein the control means, after terminating the transmission of the transmitting means, increments the attempt counter means; and  
wherein the control means discards the first frame when the attempt count of transmission attempts by the attempt counter means exceeds the predetermined attempt threshold for the class of service of the first frame.

31. The apparatus of claim 27, further comprising:  
attempt counter means for counting transmission attempts by the transmitting means;  
wherein the control means, after terminating the transmission of the transmitting means, increments the attempt counter means; and

wherein the control means discards the first frame when the attempt count of transmission attempts by the attempt counter means exceeds a predetermined attempt threshold and the class of service of the first frame falls below a predetermined discard threshold.

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32. The apparatus of claim 27, further comprising:

compute means for computing a back-off period after terminating the transmission when no frame ready for transmission has a higher class of service than the first frame; and

wherein the transmitting means in response to the control means retransmits the first frame when the back-off period has elapsed.

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33. The apparatus of claim 32, wherein the compute means computes the back-off period as a function of the class of service of the first frame.

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34. The apparatus of claim 27, further comprising:

a plurality of attempt counter means, each for counting transmission attempts by the transmitter means of frames in one of a plurality of classes of service;

wherein the control means, after terminating the transmission, increments the attempt counter means for the class of service of the first frame and for any other class of service that is not greater than the class of service of the first frame and for which a frame is pending transmission, and discards all pending frames having an attempt count that exceeds a predetermined attempt threshold.

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35. The apparatus of claim 34, wherein the control means, before transmitting the second frame, transmits a pending frame having a highest class of service that is less than the class of service of the first frame if the first frame was discarded.

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36. The apparatus of claim 27, wherein each class of service has an attempt count and a predetermined attempt threshold, further comprising:

a plurality of attempt counter means, each for counting transmission attempts by the transmitter means of frames in one of a plurality of classes of service;

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wherein the control means, after terminating the transmission, increments the attempt count means for the class of service of the first frame and for any other class of service that is not greater than the class of service of the first frame and for which a frame is pending transmission; and

wherein the control means discards each pending frame when the attempt count of transmission attempts by the attempt counter means for that frame exceeds the predetermined attempt threshold for the class of service for that frame.

37. The apparatus of claim 27, wherein each class of service has an attempt count, further comprising:

a plurality of attempt counter means, each for counting transmission attempts by the transmitter means of frames in one of a plurality of classes of service;

wherein the control means, after terminating the transmission, increments the attempt count means for the class of service of the first frame and for any other class of service that is not greater than the class of service of the first frame and for which a frame is pending transmission; and

wherein the control means discards a given pending frame having an attempt count of transmission attempts by the attempt counter means that exceeds a predetermined attempt threshold when the class of service of the given pending frame falls below a predetermined discard threshold.

38. The apparatus of claim 27, further comprising:

compute means for computing a back-off period after terminating the transmission when no frame ready for transmission has a higher class of service than the first frame; and

wherein the transmitting means in response to the control means retransmits the first frame when the back-off period has elapsed.

39. The apparatus of claim 38, wherein the compute means computes the back-off period as a function of the class of service of the first frame.

40. An apparatus for use in a half-duplex channel, the apparatus comprising:



a transmitter to transmit data over the half duplex channel;

a controller to terminate the transmitter from transmitting a first frame of the data when a collision is detected during the transmission; and

wherein the transmitter, in response to the controller, transmits a second frame of the data before retransmitting the first frame when the second frame has a higher class of service than the first frame.

41. The apparatus of claim 40, wherein the transmitter, in response to the controller, sends a jam signal before transmitting the second frame.

42. The apparatus of claim 40, further comprising:  
an attempt counter to count transmission attempts by the transmitter;  
wherein the controller, after terminating the transmission of the transmitter, increments the attempt counter; and  
wherein the controller discards the first frame when the attempt count of transmission attempts by the attempt counter exceeds a predetermined attempt threshold.

43. The apparatus of claim 40, wherein each class of service has a predetermined attempt threshold, further comprising:  
an attempt counter to count transmission attempts by the transmitter;  
wherein the controller, after terminating the transmission of the transmitter, increments the attempt counter; and  
wherein the controller discards the first frame when the attempt count of transmission attempts by the attempt counter exceeds the predetermined attempt threshold for the class of service of the first frame.

44. The apparatus of claim 40, further comprising:  
an attempt counter to count transmission attempts by the transmitter;  
wherein the controller, after terminating the transmission of the transmitter, increments the attempt counter; and

wherein the controller discards the first frame when the attempt count of transmission attempts by the attempt counter exceeds a predetermined attempt threshold and the class of service of the first frame falls below a predetermined discard threshold.

5           45.     The apparatus of claim 40, further comprising:  
               a calculator to calculate a back-off period after terminating the transmission when no  
               frame ready for transmission has a higher class of service than the first frame; and  
               wherein the transmitter retransmits the first frame when the back-off period has  
               elapsed.

10           46.     The apparatus of claim 45, wherein the calculator computes the back-off  
               period as a function of the class of service of the first frame.

15           47.     The apparatus of claim 40, further comprising:  
               a plurality of attempt counters, each to count transmission attempts by the transmitter  
               of frames in one of a plurality of classes of service;  
               wherein the controller, after terminating the transmission, increments the attempt  
               counter for the class of service of the first frame and for any other class of service that is not  
               greater than the class of service of the first frame and for which a frame is pending  
               transmission, and discards all pending frames having an attempt count that exceeds a  
               predetermined attempt threshold.

20           48.     The apparatus of claim 47, wherein the controller, before transmitting the  
               second frame, transmits a pending frame having a highest class of service that is less than the  
               class of service of the first frame if the first frame was discarded.

25           49.     The apparatus of claim 40, wherein each class of service has a predetermined  
               attempt threshold, further comprising:  
               a plurality of attempt counters, each to count transmission attempts by the first  
               transmitter of frames in one of a plurality of classes of service;

wherein the controller, after terminating the transmission of the transmitter, increments the attempt counter for the class of service of the first frame and for any other class of service that is not greater than the class of service of the first frame and for which a frame is pending transmission by the transmitter; and

wherein the controller discards each pending frame when the attempt count of transmission attempts by the attempt counter for that frame exceeds the predetermined attempt threshold for the class of service for that frame.

50. The apparatus of claim 40, further comprising:

a plurality of attempt counters, each to count transmission attempts by the first transmitter of frames in one of a plurality of classes of service;

wherein the controller, after terminating the transmission of the transmitter, increments the attempt counter for the class of service of the first frame and for any other class of service that is not greater than the class of service of the first frame and for which a frame is pending transmission by the transmitter; and

wherein the controller discards a given pending frame having an attempt count of transmission attempts by the attempt counter that exceeds a predetermined attempt threshold when the class of service of the given pending frame falls below a predetermined discard threshold.

51. The apparatus of claim 40, further comprising:

a calculator to calculate a back-off period after terminating the transmission when no frame ready for transmission has a higher class of service than the first frame; and

wherein the transmitter retransmits the first frame when the back-off period has elapsed.

52. The apparatus of claim 51, wherein the calculator computes the back-off period as a function of the class of service of the first frame.

53. A network switch comprising:

a first port in communication with a first half-duplex channel;

a second port in communication with a second half-duplex channel;  
a memory;  
wherein the first port communicates with the second port via the memory;  
wherein the first port comprises:

5           a first transmitter to transmit data over the first half-duplex channel;  
          a first controller to terminate the first transmitter from transmitting a first  
frame of the data when a collision is detected during the transmission and to  
determine a class of service for each frame; and  
          wherein the first transmitter transmits a second frame of the data before  
10       retransmitting the first frame when the second frame has a higher class of service than  
the first frame; and  
wherein the second port comprises:  
          a second transmitter to transmit data over the second half-duplex channel;  
          a second controller to terminate the second transmitter from transmitting a  
15       third frame of the data when a collision is detected during the transmission and to  
determine a class of service for each frame; and  
          wherein the second transmitter transmits a fourth frame of the data before  
retransmitting the third frame when the fourth frame has a higher class of service than  
the third frame.

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54.     The network switch of claim 53, wherein the memory comprises:  
a first memory portion to store the first and second frames; and  
a second memory portion to store the third and fourth frames.

25       55.     The network switch of claim 53, wherein:  
the first and third frames are the same; and  
the second and fourth frames are the same.

30       56.     The network switch of claim 53, wherein each of the first and second  
transmitters, in response to the first and second controllers, respectively, sends a jam signal  
before transmitting the second and fourth frames, respectively.

57. The network switch of claim 53, wherein the first port comprises:  
an attempt counter to count transmission attempts by the first transmitter.

5 58. The network switch of claim 57, wherein the first controller, after terminating  
the first transmitter from transmitting:  
increments the attempt counter; and  
discards the first frame when the attempt count of transmission attempts by the  
attempt counter exceeds a predetermined attempt threshold.

10 59. The network switch of claim 57, wherein each class of service has a  
predetermined attempt threshold, and wherein the first controller, after terminating the first  
transmitter from transmitting:  
increments the attempt counter; and  
15 discards the first frame when the attempt count of transmission attempts by the  
attempt counter exceeds the predetermined attempt threshold for the class of service of the  
first frame.

20 60. The network switch of claim 57, wherein the first controller, after terminating  
the first transmitter from transmitting:  
increments the attempt counter; and  
discards the first frame when the attempt count of transmission attempts by the  
attempt counter exceeds a predetermined attempt threshold and the class of service of the  
first frame falls below a predetermined discard threshold.

25 61. The network switch of claim 53, wherein:  
the first controller computes a back-off period after terminating the transmission  
when no frame in the first memory portion has a higher class of service than the first frame;  
and  
30 the first transmitter, in response to the first controller, retransmits the first frame when  
the back-off period has elapsed.

62. The network switch of claim 61, wherein computing the back-off period comprises:

computing the back-off period as a function of the class of service of the first frame.

63. The network switch of claim 53, wherein the first transmitter, before transmitting the second frame, in response to the first controller, transmits a pending frame having the highest class of service that is less than the class of service of the first frame if the first frame was discarded.

64. The network switch of claim 53, wherein the first controller, after terminating the first transmitter from transmitting:

increments the attempt counter for the class of service of the first frame and the attempt counters for any other class of service that is not greater than the class of service of the first frame and for which a frame is pending transmission; and

discards all pending frames having an attempt count of transmission attempts by one of the attempt counters that exceeds a predetermined attempt threshold.

65. The network switch of claim 53, wherein each class of service has a predetermined attempt threshold, and wherein the first controller, after terminating the first transmitter from transmitting:

increments the attempt counter for the class of service of the first frame and the attempt counters for any other class of service that is not greater than the class of service of the first frame and for which a frame is pending transmission; and

discards each pending frame having an attempt count of transmission attempts by one of the attempt counters that exceeds the predetermined attempt threshold for the class of service of that frame.

66. The network switch of claim 53, wherein the first controller, after terminating the first transmitter from transmitting:

increments the attempt counter for the class of service of the first frame and the attempt counters for any other class of service that is not greater than the class of service of the first frame and for which a frame is pending transmission; and

discards a given pending frame having an attempt count of transmission attempts by the attempt counter of the class of service of the given pending frame that exceeds a predetermined attempt threshold when the class of service of the given pending frame falls below a predetermined discard threshold.

67. The network switch of claim 53, wherein:

the first controller computes a back-off period after terminating the transmission when no frame in the first memory portion has a higher class of service than the first frame; and

the first transmitter, in response to the first controller, retransmits the first frame when the back-off period has elapsed.

68. The network switch of claim 67, wherein computing the back-off period comprises:

computing the back-off period as a function of the class of service of the first frame.

69. A network switch comprising:

first port means for communicating on a first half-duplex channel;

second port means for communicating on a second half-duplex channel;

memory means for communicating with the first and second port means;

wherein the first port means comprises:

first transmitter means for transmitting data over the first half-duplex channel;

first controller means for terminating the first transmitter means from transmitting a first frame of the data when a collision is detected during the transmission and for determining a class of service for each frame; and

wherein the first transmitter means transmits a second frame of the data before retransmitting the first frame when the second frame has a higher class of service than the first frame; and

wherein the second port means comprises:

second transmitter means for transmitting data over the second half-duplex channel;

second controller means for terminating the second transmitter means from transmitting a third frame of the data when a collision is detected during the transmission and for determining a class of service for each frame; and

wherein the second transmitter transmits a fourth frame of the data before retransmitting the third frame when the fourth frame has a higher class of service than the third frame.

70. The network switch of claim 69, wherein the memory comprises:  
first memory portion means for storing the first and second frames; and  
second memory portion means for storing the third and fourth frames.

71. The network switch of claim 69, wherein:  
the first and third frames are the same; and  
the second and fourth frames are the same.

72. The network switch of claim 69, wherein each of the first and second transmitter means, in response to the first and second controller means, respectively, sends a jam signal before transmitting the second and fourth frames, respectively.

73. The network switch of claim 69, wherein the first port means further comprises:

attempt counter means to count transmission attempts by the first transmitter means.

74. The network switch of claim 73, wherein the first controller means, after terminating the first transmitter means from transmitting:

increments the attempt counter means; and

discards the first frame when the attempt count of transmission attempts by the attempt counter means exceeds a predetermined attempt threshold.



75. The network switch of claim 73, wherein each class of service has a predetermined attempt threshold, and wherein the first controller means, after terminating the first transmitter means from transmitting:

increments the attempt counter means; and  
discards the first frame when the attempt count of transmission attempts the attempt counter means exceeds the predetermined attempt threshold for the class of service of the first frame.

76. The network switch of claim 73, wherein the first controller means, after terminating the first transmitter from transmitting:  
increments the attempt counter means; and  
discards the first frame when the attempt count of transmission attempts by the attempt counter means exceeds a predetermined attempt threshold and the class of service of the first frame falls below a predetermined discard threshold.

77. The network switch of claim 69, wherein:  
the first controller means computes a back-off period after terminating the transmission when no frame in the first memory portion means has a higher class of service than the first frame; and  
the first transmitter means, in response to the first controller means, retransmits the first frame when the back-off period has elapsed.

78. The network switch of claim 77, wherein computing the back-off period comprises:  
computing the back-off period as a function of the class of service of the first frame.

79. The network switch of claim 69, wherein the first transmitter means, before transmitting the second frame, in response to the first controller means, transmits a pending frame having the highest class of service that is less than the class of service of the first frame if the first frame was discarded.

80. The network switch of claim 69, wherein the first controller means, after terminating the first transmitter means from transmitting:

increments the attempt counter for the class of service of the first frame and the attempt counters for any other class of service that is not greater than the class of service of the first frame and for which a frame is pending transmission; and

discards all pending frames having an attempt count of transmission attempts by one of the attempt counter means that exceeds a predetermined attempt threshold.

81. The network switch of claim 69, wherein each class of service has a predetermined attempt threshold, and wherein the first controller means, after terminating the first transmitter means from transmitting:

increments the attempt counter for the class of service of the first frame and the attempt counters for any other class of service that is not greater than the class of service of the first frame and for which a frame is pending transmission; and

discards each pending frame having an attempt count of transmission attempts by one of the attempt counter means that exceeds the predetermined attempt threshold for the class of service of that frame.

82. The network switch of claim 69, wherein the first controller means, after terminating the first transmitter from transmitting:

increments the attempt counter for the class of service of the first frame and the attempt counters for any other class of service that is not greater than the class of service of the first frame and for which a frame is pending transmission; and

discards a given pending frame having an attempt count of transmission attempts by the attempt counter means of the class of service of the given pending frame that exceeds a predetermined attempt threshold when the class of service of the given pending frame falls below a predetermined discard threshold.

83. The network switch of claim 69, wherein:

the first controller means computes a back-off period after terminating the transmission when no frame in the first memory portion means has a higher class of service than the first frame; and

the first transmitter means, in response to the first controller means, retransmits the first frame when the back-off period has elapsed.

84. The network switch of claim 83, wherein computing the back-off period comprises:

computing the back-off period as a function of the class of service of the first frame.

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